

Claims

1. An optical-element integrated semiconductor integrated circuit wherein two or more optical elements for converting electrical signals, that are the input to and the output from a semiconductor integrated circuit, to optical signals are mounted on said semiconductor integrated circuit; wherein the heights of said two or more optical elements are identical.
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2. An optical-element integrated semiconductor integrated circuit wherein two or more optical elements for converting electrical signals, that are the input to and the output from a semiconductor integrated circuit, to optical signals are mounted on said semiconductor integrated circuit; wherein:
5 said two or more optical elements are divided into two or more groups;
and
the heights of optical elements that belong to the same group are identical, but the heights of optical elements that belong to different groups are different.
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3. An optical-element integrated semiconductor integrated circuit according to claim 1, wherein the melting point of solder that secures a portion of said two or more optical elements to said semiconductor integrated circuit differs from the melting point of solder that secures other optical elements to said semiconductor integrated circuit.
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4. An optical-element integrated semiconductor integrated circuit according to claim 2, wherein the melting point of solder that secures a portion of said two or more optical elements to said semiconductor integrated circuit

differs from the melting point of solder that secures other optical elements to
5 said semiconductor integrated circuit.

5. An optical-element integrated semiconductor integrated circuit comprising:

- a semiconductor integrated circuit having two or more electrical signal output ports arranged irregularly; and
- 5 two or more light-emitting devices connected to the corresponding said electrical signal output ports of said semiconductor integrated circuit for converting electrical signals supplied as output from a corresponding electrical signal output port to an optical signal and supplying these optical signals to the outside;
- 10 wherein the heights of the light-emitting surfaces of said two or more light-emitting devices that are connected to said electrical signal output ports are identical.

6. An optical-element integrated semiconductor integrated circuit comprising:

- a semiconductor integrated circuit having two or more electrical signal input ports arranged irregularly; and
- 5 two or more photodetectors connected to the corresponding said electrical signal input ports of said semiconductor integrated circuit for converting optical signals received as input from the outside to electrical signals and supplying these electrical signals to corresponding electrical signal input ports;

10 wherein the heights of the photoreception surfaces of said two or more photodetectors that are connected to said electrical signal input ports are identical.

7. An optical-element integrated semiconductor integrated circuit comprising:

a semiconductor integrated circuit having two or more irregularly arranged electrical signal output ports and electrical signal input ports; 5 two or more light-emitting devices connected to corresponding electrical signal output ports of said semiconductor integrated circuit for converting electrical signals supplied as output from corresponding electrical signal output ports to optical signals and supplying these optical signals to the outside; and

10 two or more photodetectors connected to corresponding electrical signal input ports of said semiconductor integrated circuit for converting optical signals received as input from the outside to electrical signals and supplying these electrical signals to the corresponding said electrical signal input ports;

15 wherein the heights of the light-emitting surfaces of said two or more light-emitting devices that are connected to said electrical signal output ports are identical, and the heights of the photoreception surfaces of said two or more photodetectors that are connected to said electrical signal input ports are identical.

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8. A optical-element integrated semiconductor integrated circuit according to claim 7, wherein the heights of said light-emitting surfaces of said light-emitting devices connected to said electrical signal output ports and the

heights of said photoreception surfaces of said photodetectors connected to
5 said electrical signal input ports are identical to each other.

9. An optical-element integrated semiconductor integrated circuit according to claim 7, wherein the melting point of solder that secures said light-emitting devices to said semiconductor integrated circuit differs from the melting point of solder that secures said photodetectors to said semiconductor
5 integrated circuit.

10. An optical-element integrated semiconductor integrated circuit according to claim 5, wherein an optics element for focusing light emitted from the light-emitting surface is provided in at least one of said light-emitting devices.

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11. An optical-element integrated semiconductor integrated circuit according to claim 7, wherein an optics element for focusing light emitted from the light-emitting surface is provided in at least one of said light-emitting devices.

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12. An optical-element integrated semiconductor integrated circuit according to claim 6, wherein an optics element for focusing light that is received from the outside toward said photoreception surface is provided in at least one of said photodetectors.

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13. An optical-element integrated semiconductor integrated circuit according to claim 7, wherein an optics element for focusing light that is

received from the outside toward said photoreception surface is provided in at least one of said photodetectors.

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14. An optical-element integrated semiconductor integrated circuit according to claim 5, wherein said two or more light-emitting devices or photodetectors have a common electrode pattern.

15. An optical-element integrated semiconductor integrated circuit according to claim 6, wherein said two or more light-emitting devices or photodetectors have a common electrode pattern.

16. An optical-element integrated semiconductor integrated circuit according to claim 7, wherein said two or more light-emitting devices or photodetectors have a common electrode pattern.

17. An fabrication method of an optical-element integrated semiconductor integrated circuit in which two or more optical elements for converting electrical signals, that are the input to or output from a semiconductor integrated circuit, to optical signals are mounted on said

5 semiconductor integrated circuit; said fabrication method including optical element mounting steps comprising steps of:

forming bumps on necessary optical elements in an optical element array;

using said bumps to mount said optical element array on said

10 •semiconductor integrated circuit and to connect said necessary optical elements to said semiconductor integrated circuit;

covering said necessary optical elements that have been connected to
said semiconductor integrated circuit with a protective film;
removing unnecessary optical elements that are not covered by said
15 protective film from said optical element array; and
removing said protective film.

18. A fabrication method of an optical-element integrated
semiconductor integrated circuit in which two or more optical elements for
converting electrical signals, that are the input to and output from a
semiconductor integrated circuit, to optical signals are mounted on said
5 semiconductor integrated circuit; said fabrication method including optical
element mounting steps comprising steps of:
covering necessary optical elements in an optical element array with a
protective film;
removing the functional portions of unnecessary optical elements that
10 are not covered by said protective film;
removing said protective film; and
mounting said optical element array, in which the functional portions of
said unnecessary optical elements have been removed, on said
semiconductor integrated circuit, and connecting said necessary optical
15 elements to said semiconductor integrated circuit.

19. A fabrication method of an optical-element integrated
semiconductor integrated circuit in which two or more optical elements for
converting electrical signals, that are the input to and output from a
semiconductor integrated circuit, to optical signals are mounted on said
5 semiconductor integrated circuit; said fabrication method comprising:

a first optical element mounting step that includes steps of:

- forming bumps on necessary optical elements in an optical element array;
- using said bumps to mount said optical element array to said semiconductor integrated circuit and to connect said necessary optical elements to said semiconductor integrated circuit;
- covering said necessary optical elements that have been connected to said semiconductor integrated circuit with a protective film;
- removing unnecessary optical elements that are not covered with said protective film from said optical element array; and
- removing said protective film; and

a second optical element mounting step that includes steps of:

- covering necessary optical elements in an optical element array with a protective film;
- removing the functional portions of unnecessary optical elements that are not covered by said protective film;
- removing said protective film; and
- mounting said optical element array in which the functional portions of said unnecessary optical elements have been removed to said semiconductor integrated circuit, and connecting said necessary optical elements to said semiconductor integrated circuit.

20. A fabrication method of an optical-element integrated semiconductor integrated circuit according to claim 19, wherein light-emitting devices are mounted on said semiconductor integrated circuit by one of said first and second optical element mounting steps, and photodetectors are

5 mounted on said semiconductor integrated circuit by the other optical element mounting step.

21. A fabrication method of an optical-element integrated semiconductor integrated circuit according to claim 17, said method including a step of etching said element substrate to produce a thin film.

22. A fabrication method of an optical-element integrated semiconductor integrated circuit according to claim 18, said method including a step of etching said element substrate to produce a thin film.

23. A fabrication method of an optical-element integrated semiconductor integrated circuit according to claim 19, said method including a step of etching said element substrate to produce a thin film.

24. A fabrication method of an optical-element integrated semiconductor integrated circuit according to claim 17, said method including a step of etching said element substrate to form a lens.

25. A fabrication method of an optical-element integrated semiconductor integrated circuit according to claim 18, said method including a step of etching said element substrate to form a lens.

26. A fabrication method of an optical-element integrated semiconductor integrated circuit according to claim 19, said method including a step of etching said element substrate to form a lens.